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CRUTCHFIELD, CHRISTOPHER M	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/544,156	KOJIMA ET AL.	
	Examiner	Art Unit	
	Christopher Crutchfield	2466	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 23 February 2010.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4-6,9,12,15,16,18 and 19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 4-6, 9, 12, 15, 16, 18 and 19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 101

1. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claim 4 is rejected under 35 U.S.C. 101 because, under the broadest reasonable interpretation, it is directed to software per se, which is not a process, machine manufacture or composition of matter and therefore does not constitute statutory subject matter.

In order to qualify as statutory subject matter, claimed subject matter must fall within one of the four statutory categories of 35 USC 101. In re Nuijten, 500 F3d 1346, 1354 84 USPQ2d 1495, 1500 (2007) ("Claimed subject matter must be within at least one of four categories enumerated in 35 U.S.C. §101 in order to be patentable, but once that requirement is satisfied, court need not be overly concerned about which of those categories claimed subject matter falls into; however, four categories in Section 101 together describe exclusive reach of patentable subject matter, and if claim covers material not found in any of those four categories, then claim falls outside plainly expressed scope of Section 101 even if subject matter is otherwise new and useful."). Software per se it is not a process, manufacture or composition of matter. Furthermore, since it lacks any physical manifestation it cannot comprise a machine. See *Id at 1354.* See also Ex Parte *Cherian*, Appeal No. 2008-004157, BPAI, (Non-Precedential) (2009); Ex Parte Magid, Appeal No. 2008-3824, BPAI, (Non-Precedential) (2009).

Since the "optical edge router" of claim 4 is implemented using a plurality of "sections" for processing packets, the broadest reasonable interpretation of claim 4 is that it is directed to software per se. This interpretation is strengthened by the identical language of claim 5, which

in fact recites that the "sections" of claim 4 can be embodied purely in software. Therefore, claim 4 is rejected as being directed to software per se.

Claims 5, 12 and 15 are rejected under 35 U.S.C. 101 because they are directed to non statutory subject matter. That is, claims 5, 12 and 15 are directed to a computer program that is not embodied in a tangible computer readable medium. Although the claims recite the use of a “computer readable medium”, the broadest reasonable interpretation of the term computer-readable storage medium may include "carrier wave signals". Carrier wave signals are an ephemeral and non-tangible transmission and do not fall within one of the four categories of patentable subject matter provided by 35 USC 101. See In re Nuijten, 500 F.3d 1346, 84 USPQ2d 1495 (Fed. Cir. 2007). It is suggested that the term “computer readable medium” be changed to “non-transitory computer readable medium”.

Claim 9 is rejected under 35 U.S.C. 101 because, under the broadest reasonable interpretation, it is directed to software per se, which is not a process, machine manufacture or composition of matter and therefore does not constitute statutory subject matter.

In order to qualify as statutory subject matter, claimed subject matter must fall within one of the four statutory categories of 35 USC 101. In re Nuijten, 500 F3d 1346, 1354 84 USPQ2d 1495, 1500 (2007) (“Claimed subject matter must be within at least one of four categories enumerated in 35 U.S.C. §101 in order to be patentable, but once that requirement is satisfied, court need not be overly concerned about which of those categories claimed subject matter falls into; however, four categories in Section 101 together describe exclusive reach of patentable subject matter, and if claim covers material not found in any of those four categories, then claim falls outside plainly expressed scope of Section 101 even if subject matter is otherwise new and useful.”). Software per se it is not a process, manufacture or composition of matter. Furthermore, since it lacks any physical manifestation it cannot comprise a machine. See *Id at*

1354. See also Ex Parte *Cherian*, Appeal No. 2008-004157, BPAI, (Non-Precedential) (2009); Ex Parte Magid, Appeal No. 2008-3824, BPAI, (Non-Precedential) (2009).

Since the “edge router” of claim 9 is implemented using a plurality of “sections” for processing packets, the broadest reasonable interpretation of claim 9 is that it is directed to software per se. This interpretation is strengthened by the nearly identical language of claim 11 which in fact recites that the "sections" of claim 9 can be embodied as “functions” purely in software. Therefore, claim 9 is rejected as being directed to software per se.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

    1. Determining the scope and contents of the prior art.
    2. Ascertaining the differences between the prior art and the claims at issue.
    3. Resolving the level of ordinary skill in the pertinent art.
    4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any

evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. **Claims 1, 16, 18 and 19** are rejected under 35 U.S.C. 103(a) as being unpatentable over X*u*, et al. (Y. Xu, A. Basu and Y. Xue, IETF Draft, June 2002, A BGP/GMPLS Solution for Inter-Domain Optical Networking) in view of *Rajagoplan,* et al. (B. Rajagoplan, J. Liciani, D. Aduche, B. Cain, B. Jamoussi and D. Saha, IP over Optical Networks: A Framework – Second Draft Version, 6 June 2002, Internet Engineering Task Force, Pages 1-41) and *Kompella*, et al. (K. Kompella, J. Drake, G. Bernstein, D. Fedyk, E. Mannie, D. Saha, and V. Sharma, OSPF Extensions in Support of Generalized MPLS, Network Working Group- Internet draft: draft-kompella-ospf-gmpls-extensions-02, July 2001, Pages 1-9).

Regarding Claim 1, X*u* discloses an optical network comprising:

a. Sections for establishing optical paths using Resource reSerVation Protocol-Traffic Enqineerinq (RSVP-TE) as a signaling protocol, for Generalized Multi- Protocol Label Switching (GMPLS) (Page 5, Figure 1, Connection between X1 and X2 and Page 20, Section 8.1.1). (The system of *Xu* discloses an optical network wherein X1 and X2 are Optical Cross Connects [OXCs] and establish optical paths [Page 5, "X1, X2, X3,…are Optical Cross Connects (OXCs)]. *Xu* further discloses that RSVP-TE may be used in the provider network in order to signal the establishment of intra-domain paths [Page 20, Section 8.1.1].)

b. A plurality of optical edge routers (Figure 1, A2 and B2) for connecting external IP networks (Figure 1, Client B and Client A) to the optical network (See Page 4 – the Provider networks are optical GMPLS networks).

c. A plurality of optical cross connects, (Page 5, Figure 1, X1 and X2) for connecting the optical edge routers by the optical paths, (Page 5, Figure 1, Connections between X1 and Y2) having switching sections (Page 5, the Optical Cross Connects switch the paths) with respect to an optical pulse unit (It is officially noted that in an optical network, their must be an optical pulse unit to generate an optical signal, therefore the optical cross connects switch the optical paths with respect to an optical pulse unit).

d. Wherein each of the optical edge routers has an a IP network instance for maintaining a routing table in each of the external IP networks (Routers A2, A3, A5 and A7 Maintain Standard IP routing tables which determine the routes to the layer 3 neighbors [Page 7, Section 6.1]. These routes are distributed via BGP instances maintained at each IP router [Page 5].)

e. Wherein *each optical ingress router* has an optical network control instance for maintaining topology information in the optical network (Page 9, “In provider networks, both….” to end of page) and switching/signaling the optical paths (Figure 1, Connection between A2 and A7 and Page 7, Numbers 7-9). (X1, X2, Y1 and Y2 are Optical Cross Connects [OXCs] and establish and switch optical paths connecting the edge routers [i.e. X1 and Y2] [Page 5, Figure 1, Connection between X1 and Y2 and Page 5, “X1, X2,

X3,…are Optical Cross Connects (OXCs)]. Intra domain link status information is disseminated using an IGP and stored in all border network entities (BNEs) and non BNEs [Page 9, “In provider networks, both….” to end of page]. Therefore, topology information [including, at a minimum, fiber optic link status] concerning the internal links [including the optic links] is exchanged via an IGP and stored by the border network entity (BNE)/edge router control instance. Finally, upon demand, a path for carrying packets between Client A, Location 1 and Client A, Location 2, is created when the ingress BGP speaker/edge router feeds a signal that establishes the route to the intra-domain routing process [Figure 1, Connection between A2 and A7 and Page 7, Numbers 7-9]. The path may be set up/torn down on demand [Page 8, Numeral 2].)

f. Wherein the routing protocols for exchanging route information among the external IP networks are activated among the optical network control instances in the *optical ingress* routers to which the external IP networks are connected (Page 6). (The optical ingress routers/provider BNEs treat the corresponding BNE at the other side of an optical link as a BGP neighbor [Page 6, - X2 treats Y1 as a BGP circuit switching neighbor/peer]. The route information is then exchanged via an interior Border Gateway Protocol [Page 6].)

g. Wherein BGPs are used for protocols for exchanging the route information of the external IP networks (Page 6). (The optical ingress routers/provider BNEs treat the corresponding BNE at the other side of an optical link as a BGP neighbor [Page 6, - X2 treats Y1 as a BGP circuit switching neighbor/peer]. The route information of the external IP networks is then exchanged via an interior Border Gateway Protocol [Page 6].)

h. Wherein the optical paths are wavelength paths (Pages 13-14). (The path type may be a lambda [i.e. wavelength] path [Page 14, Encoding type “Lambda”].)

Xu fails to disclose that each of the optical edge routers have an optical network control instance for maintaining topology information in the optical network and switching/signaling the optical paths and an optical network further comprising sections for establishing optical paths using OSPF as a routing protocol. In the same field of endeavor, *Rajagoplan* discloses that each of the optical edge routers have an optical network control instance for maintaining topology information in the optical network and switching/signaling the optical paths and an optical network further comprising sections for establishing optical paths using OSPF as a routing protocol and Resource reSerVation Protocol-Traffic Enqineerinq (RSVP-TE) as a signaling protocol, for Generalized Multi- Protocol Label Switching (GMPLS) (Page 15, Section 6, Pages 13-14, Section 5.2, Page 9, Figure 1 and Pages 15-16, Section 6.1.1). (If the exterior IP domain is trusted, the edge routers can receive interior routing information from the optical network and may also signal explicit routes through the network [Page 15, Section 6, Pages 13-14, Section 5.2]. It is further inherent that the received information concerning the interior state of the optical network is stored, as it is used for explicit route determination at the edge nodes. Finally, *Rajagoplan* discloses that OSPF Opaque-LSAs, with the appropriate extensions, may be used to distribute topology information, including topology state information and that RSVP-TE may be used to establish paths within the network [Pages 15-16, Section 6.1.1].)

Therefore, since *Rajagoplan* suggests a combined IP router using OSPF and RSVP-TE, it would have been obvious to a person of ordinary skill in the art at the time of the invention to implement combined IP and optical signaling into as taught by *Rajagoplan* into the teachings of *Xu.* Combined IP and optical signaling into as taught by *Rajagoplan* can be implemented into

the system of *Xu* by moving the optical network control instance from the optical ingress router to the optical edge router as taught by *Rajagoplan* and establishing paths using RSVP-TE while using OSPF-TE for the distribution of topology information. The motive to combine is provided by *Rajagoplan* is to allow the IP network to use explicit route signaling if the IP network is trusted, while using common and well known protocols to discover and establish routes through the network (Page 15, Section 6, Pages 13-14, Section 5).

X*u* fails to disclose an optical network wherein the routing protocols for exchanging route information among the external IP networks are activated among the optical network control instances in the edge routers to which the external IP networks are connected and wherein BGPs *initiated in the optical edge router* are used for protocols for exchanging the route information of the external IP networks. In the same field of endeavor, *Rajagoplan* discloses an optical network wherein the routing protocols for exchanging route information among the external IP networks are activated among the optical network control instances in the edge routers to which the external IP networks are connected and wherein BGPs *initiated in the optical edge router* are used for protocols for exchanging the route information of the external IP networks (Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1). (The system of *Rajagoplan* discloses moving the optical path signaling and the edge of the internal optical network from the ingress edge provider router to the customer edge IP router [Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1].

Therefore, since *Rajagoplan* suggests including the customer edge router in the internal optical network and using the customer edge router/optical ingress router to signal and establish optical paths that link the two customer networks, it would have been obvious to a person of ordinary skill in the art at the time of the invention to move the BGP signaling to the edge of the network. That is, since the border of the optical network has been moved out to the customer

edge, it would have been obvious to a person of ordinary skill in the art at the time of the invention that the border gateway protocol signaling that is associated with the border of the network should also be moved to the edge of the network along with the optical network control instance. Edge BGP as taught by *Rajagoplan* can be combined with the system of *Xu* by moving the BGP signaling from the provider edge router to the customer edger router, as taught by *Rajagoplan,* and communicating the BGP state between the customer edge routers using the same method as was previously used to communicate between provider edge routers as taught by *Xu* (See *Xu*, Page 6)*.* The motive to combine is to allow the dissemination of IP routes to other network domains.

Xu fails to disclose an optical network further comprising sections for establishing optical paths using OSPF-TE as a routing protocol. In the same field of endeavor, *Kompella* discloses an optical network further comprising sections for establishing optical paths using OSPF-TE as a routing protocol (Page 3, Abstract and Pages 5). (The system of *Kompella* discloses the use of OSPF-TE in a GMPLS network in order to transmit traffic load information within the network.)

Therefore, since *Kompella* discloses the use of OSPF-TE in a GMPLS network, it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the OSPF-TE routing protocol of *Kompella* with the system of *Xu* by replacing the OSPF protocol of *Xu* as modified by *Rajagoplan* with OSPF-TE to allow the system to transmit extended LSAs with traffic engineering information in the network. The motive to combine is provided by *Kompella* and is to allow the OSPF routing protocol to carry extended information that enables the use of traffic engineering to improve network utilization and robustness (See Pages 3-4).

Regarding claim 16, *Xu* discloses An information transmission network system:

a. Having a plurality of line exchangers (Figure 1, X1-X4, Page 5, "…X1-X5…are optical cross connects) and a plurality of packet exchangers, for setting communication lines among the packet exchangers, (Figure 1, A2, B2, A3, A5, A7) the line exchangers and the packet exchangers being connected by communication lines, (Figure 1, Connection between A2 and X1) wherein, the line exchangers have a line switch and a section for controlling line paths and wherein the line switch has a function for connecting the communication lines, connected to the line exchangers, arbitrarily (It is officially noted that optical cross connects contain line switches that can connect input and output ports arbitrarily).

b. Wherein each of the packet exchangers, (Figure 1, Element A2) connected to the line exchangers (Figure 1, Element X5), has a packet switch and a section for controlling packet paths and the packet switch has functions for selecting communication lines for transmission and outputting in accordance with packet-ingress-side's information transmitted via the communication lines and the section for controlling packet paths acknowledges connection-related-information with respect to packet exchange among the packet exchangers connected via the communication lines, by exchanging the information for the packet paths via the communication lines, and determines the communication lines for output in accordance with the packet-ingress-side's information (Pages 4-7). (Routers A2, A3, A5 and A7 Maintain Standard IP routing tables which determine the routes to the layer 3 neighbors [Page 7, Section 6.1]. These routes are distributed via BGP instances maintained at each IP router via the communication lines [Page 5].)

c. Wherein the communication lines are Synchronous Optical NETwork/Synchronous Digital Hierarchy (SONET/SDH) lines (Pages 4-7 and 14). (The communications lines used in the system of *Xu* may comprise underlying SONET/SDH transmission paths [See Page 14, LSP Type - “SDH" and "SONET"].)

Xu further disclose that a separate *optical ingress router* has a section for controlling line paths, (Pages 7 and 9, The ingress edge router/BNE controls the establishment of label switched paths, and therefore the line paths) and a cooperative control section (Pages 7 and 9, The IP egress edge router of the client network contacts the ingress edge router in the provider network via BGP to initiate a label switched path) wherein:

a. The section for controlling line paths has functions for transmitting messages to the line exchangers to set up lines in accordance with the instructed paths so that the line exchangers, receiving the messages for controlling and setting the connected lines, set up the communication lines, and sending control messages to the line exchangers for setting the lines in accordance with the instructed paths (Page 7, Point 8, The ingress BGP speaker decides the next hop BGP speaker and initiates intra domain label switch path creation).

b. The sections for controlling line paths in the *optical ingress router* are connected to at least the sections for controlling line paths in the line exchangers via lines among the packet exchangers and the line exchangers (Pages 6 and 7 - The optical ingress

router/provider edge router controls the optical cross connects via the control plane and the section for controlling line paths.)

c. The sections for controlling line paths in the line exchangers and the sections for controlling line paths in the *optical ingress router* have a functions for acknowledging line connection conditions in a communication network, by exchanging information of the communication conditions among the communication lines (Page 9, “In provider networks, both….” to end of page). (Intra domain link status information is disseminated using an IGP and stored in all border network entities (BNEs) and non BNEs [Page 9, “In provider networks, both….” to end of page]. Therefore, topology information [including, at a minimum, fiber optic link status] concerning the internal links [including the optic links] is exchanged via an IGP and stored by the border network entity (BNE)/edge router control instance. Finally, upon demand, a path for carrying packets between Client A, Location 1 and Client A, Location 2, is created when the ingress BGP speaker/edge router feeds a signal that establishes the route to the intra-domain routing process [Figure 1, Connection between A2 and A7 and Page 7, Numbers 7-9]. The path may be set up/torn down on demand [Page 8, Numeral 2].)

d. A cooperative control section that has a function for receiving instructions regarding new communication lines, referring to two pieces of information, connection information, with respect to line-exchanging-network, collected by the *optical ingress router*, and connection information with respect to packet-exchange collected by the section for controlling packet paths. (The provider ingress edge router has an intra-domain routing process that creates the intra domain label switched path based on the interior optical

network information [Page 7, Section 8] and the egress edge IP address [Page 7, Section 8]. Therefore, it is inherent that the instruction to create such a path must include the connection information of the line exchange and the packet path information.)

Xu fails to disclose each of the *packet exchangers*, connected to the line exchangers, has a section for controlling line paths, and a cooperative control section wherein the section for controlling line paths has functions for transmitting messages to the line exchangers to set up lines in accordance with the instructed paths so that the line exchangers, receiving the messages for controlling and setting the connected lines, set up the communication lines, and sending control messages to the line exchangers for setting the lines in accordance with the instructed paths, the sections for controlling line paths in the packet exchangers are connected to at least the sections for controlling line paths in the line exchangers via lines among the packet exchangers and the line exchangers the sections for controlling line paths in the line exchangers and the sections for controlling line paths in the packet exchangers have a functions for acknowledging line connection conditions in a communication network, by exchanging information of the communication conditions among the communication lines and a cooperative control section that sections select paths, being used for the new communication lines, and instructing the section for controlling line paths to set paths being used for the new communication lines wherein Open Shortest Path First-Traffic Engineering (OSPF) is used as a communication protocol for the communication lines. In the same field of endeavor, *Rajagoplan* discloses each of the packet exchangers, connected to the line exchangers, has a section for controlling line paths, and a cooperative control section wherein the section for controlling line paths has functions for transmitting messages to the line exchangers to set up lines in accordance with the instructed paths so that the line exchangers, receiving the messages for

controlling and setting the connected lines, set up the communication lines, and sending control messages to the line exchangers for setting the lines in accordance with the instructed paths, the sections for controlling line paths in the packet exchangers are connected to at least the sections for controlling line paths in the line exchangers via lines among the packet exchangers and the line exchangers the sections for controlling line paths in the line exchangers and the sections for controlling line paths in the packet exchangers have a functions for acknowledging line connection conditions in a communication network, by exchanging information of the communication conditions among the communication lines wherein Open Shortest Path First-Traffic Engineering (OSPF) is used as a communication protocol for the communication lines (Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1). (If the exterior IP domain is trusted, the edge routers can receive interior routing and link state information from the optical network and may also signal explicit routes through the network via the control domain [Page 15, Section 6, Pages 13-14, Section 5.2]. It is further inherent that the received information concerning the interior state of the optical network is stored, as it is used for explicit route determination at the edge nodes. Finally it is inherent that there exists cooperative control between the IP [i.e. packet exchanger] and MPLS [i.e. path controller] signaling to establish the routes, as the routes are established responsive to demands to access remote IP networks, but are implemented using MPLS label switch establishment commands [Page 15-20, Section 6 and Pages 13-14, Section 5.2]. Finally, *Rajagoplan* discloses that OSPF Opaque-LSAs, with the appropriate extensions, may be used to distribute topology information, including topology state information and that RSVP-TE may be used to establish paths within the network [Pages 15-16, Section 6.1.1].)

Therefore, since *Rajagoplan* suggests a combined IP router utilizing OSPF, it would have been obvious to a person of ordinary skill in the art at the time of the invention to

implement combined IP and optical signaling into as taught by *Rajagoplan* into the teachings of *Xu.* Combined IP and optical signaling into as taught by *Rajagoplan* can be implemented into the system of *Xu* by moving the optical network control instance from the optical ingress router to the optical edge router as taught by *Rajagoplan* and implementing cooperative IP and MPLS control of routing in the separated packet and control units of *Xu* by means of BGP signaling and OSPF. The motive to combine is provided by *Rajagoplan* and is to allow the IP network to use explicit route signaling if the opposing MPLS network is trusted (Page 15, Section 6, Pages 13-14, Section 5).

Xu fails to disclose an optical network further comprising sections for establishing optical paths using OSPF-TE as a routing protocol. In the same field of endeavor, *Kompella* discloses an optical network further comprising sections for establishing optical paths using OSPF-TE as a routing protocol (Page 3, Abstract and Pages 5). (The system of *Kompella* discloses the use of OSPF-TE in a GMPLS network in order to transmit traffic load information within the network.)

Therefore, since *Kompella* discloses the use of OSPF-TE in a GMPLS network, it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the OSPF-TE routing protocol of *Kompella* with the system of *Xu* by replacing the OSPF protocol of *Xu* as modified by *Rajagoplan* with OSPF-TE to allow the system to transmit extended LSAs with traffic engineering information in the network. The motive to combine is provided by *Kompella* and is to allow the OSPF routing protocol to carry extended information that enables the use of traffic engineering to improve network utilization and robustness (See Pages 3-4).

X*u* fails to dislcose an information transmission network system for setting the communication lines among the packet exchangers and packet/line exchangers, having packet/line exchangers in which the packet exchangers and the line exchangers are integrated.

However, the integration of a packet exchanger and a line exchanger was well known in the pertinent art at the time of the invention. Thus it would have been obvious to a person of ordinary skill in the pertinent art at the time of the invention to integrate the packet exchanger and the edge line exchanger of X*u*, et al. The packet exchanger (Figure 1, A2, B2, A3, A5, A7) and the edge line exchanger of X*u*, et al. (Figure 1, X1, X3, and Y2) can be combined by including both in the same device and maintaining the connection between each internally. The motive to combine the packet exchanger and the edge line exchanger of X*u*, et al. is to allow for an integrated device that is smaller and cheaper to produce.

Regarding claim 18, *Xu* discloses a packet exchanger (Figure 1, Element A2 and Page 4) in an information transmission network system, having a plurality of line exchangers and, comprising a packet switch (Figure 1, Element A2) having a function for selecting communication lines used for transmittance, in accordance with packet-ingress-side's information transmitted by the communication lines and outputting (Pages 4-7). (Routers A2, A3, A5 and A7 Maintain Standard IP routing tables which determine the routes to the layer 3 neighbors [Page 7, Section 6.1]. These routes are distributed via BGP instances maintained at each IP router via the communication lines [Page 5].)

Xu further discloses a plurality of *optical ingress routers* (Figure 1, Elements X1 and X2), for setting communication lines among the packet exchangers (Page 7, Section 8) comprising:

a. A section for controlling packet paths having functions for acknowledging connection-related-information with respect to packet exchange by exchanging information of the packet paths via the communication lines among the packet exchangers connected via the communication lines, and determining the communication lines for output (Page 7,

Point 8, The ingress BAP speaker decides the next hop BGP speaker and initiates intra domain label switch path creation).

b. At least one section for controlling line paths in the line exchangers, connected to the communication lines among the packet exchangers/line exchangers, (Figure 1, Connection between X1 and X5) for exchanging connection information of the communication lines and acknowledging line connection condition in a communication network (Page 9, “In provider networks, both….” to end of page) wherein the section for controlling line paths have functions for transmitting messages to the line exchangers to set up lines in accordance with the instructed paths so that the line exchangers receive the messages for controlling and setting the connected lines, set up the communication lines, and send control messages to the line exchangers for setting the lines in accordance with the instructed paths (Page 7, Section 8 – See (b), Supra). (Intra domain link status information is disseminated using an IGP and stored in all border network entities (BNEs) and non BNEs [Page 9, “In provider networks, both….” to end of page]. Therefore, topology information [including, at a minimum, fiber optic link status] concerning the internal links [including the optic links] is exchanged via an IGP and stored by the border network entity (BNE)/edge router control instance. Finally, upon demand, a path for carrying packets between Client A, Location 1 and Client A, Location 2, is created when the ingress BGP speaker/edge router feeds a signal that establishes the route to the intra-domain routing process [Figure 1, Connection between A2 and A7 and Page 7, Numbers 7-9]. The path may be set up/torn down on demand [Page 8, Numeral 2].)

c. A cooperative control section having a function for receiving instructions by new communication lines, referring to two pieces of information, connection information, with respect to the packet exchange, collected by the section for controlling line paths, (i.e. information received via IGPs) and connection information with respect to the packet exchange collected by the section for controlling packet paths, (i.e the BGP request from the packet router identifying the egress IP sought to be connected) selecting paths used for the new communication lines, and instructing the section for controlling line paths to set paths used for the new communication lines (Pages 7-8). (The provider ingress edge router has an intra-domain routing process that creates the intra domain label switched path based on the interior optical network information [Page 7, Section 8] and the egress edge IP address [Page 7, Section 8]. Therefore, it is inherent that the instruction to create such a path must include the connection information of the line exchange and the packet path information.)

d. Wherein the communication lines are Synchronous Optical NETwork/Synchronous Digital Hierarchy (SONET/SDH) lines (Pages 4-7 and 14). (The communications lines used in the system of *Xu* may comprise underlying SONET/SDH transmission paths [See Page 14, LSP Type - “SDH" and "SONET"].)

Xu fails to disclose a plurality of *packet exchangers* for setting communication lines among the packet exchangers comprising a section for controlling packet paths having functions for acknowledging connection-related-information with respect to packet exchange by exchanging information of the packet paths via the communication lines among the packet exchangers connected via the communication lines, and determining the communication lines

for output, at least one section for controlling line paths in the line exchangers, connected to the communication lines among the packet exchangers/line exchangers, for exchanging connection information of the communication lines and acknowledging line connection condition in a communication network wherein the section for controlling line paths have functions for transmitting messages to the line exchangers to set up lines in accordance with the instructed paths so that the line exchangers receive the messages for controlling and setting the connected lines, set up the communication lines, and send control messages to the line exchangers for setting the lines in accordance with the instructed paths and a cooperative control section having a function for receiving instructions by new communication lines, referring to two pieces of information, connection information, with respect to the packet exchange, collected by the section for controlling line paths, and connection information with respect to the packet exchange collected by the section for controlling packet paths, selecting paths used for the new communication lines, and instructing the section for controlling line paths to set paths used for the new communication lines wherein Open Shortest Path First-Traffic Engineering (OSPF) is used as a communication protocol for the communication lines. In the same field of endeavor, *Rajagoplan* discloses a plurality of *packet exchangers* for setting communication lines among the packet exchangers comprising a section for controlling packet paths having functions for acknowledging connection-related-information with respect to packet exchange by exchanging information of the packet paths via the communication lines among the packet exchangers connected via the communication lines, and determining the communication lines for output, at least one section for controlling line paths in the line exchangers, connected to the communication lines among the packet exchangers/line exchangers, for exchanging connection information of the communication lines and acknowledging line connection condition in a communication network wherein the section for controlling line paths have functions for

transmitting messages to the line exchangers to set up lines in accordance with the instructed paths so that the line exchangers receive the messages for controlling and setting the connected lines, set up the communication lines, and send control messages to the line exchangers for setting the lines in accordance with the instructed paths and a cooperative control section having a function for receiving instructions by new communication lines, referring to two pieces of information, connection information, with respect to the packet exchange, collected by the section for controlling line paths, and connection information with respect to the packet exchange collected by the section for controlling packet paths, selecting paths used for the new communication lines, and instructing the section for controlling line paths to set paths used for the new communication lines wherein Open Shortest Path First-Traffic Engineering (OSPF) is used as a communication protocol for the communication lines (Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1). (If the exterior IP domain is trusted, the edge routers can receive interior routing and link state information from the optical network and may also signal explicit routes through the network via the control domain [Page 15, Section 6, Pages 13-14, Section 5.2]. It is further inherent that the received information concerning the interior state of the optical network is stored, as it is used for explicit route determination at the edge nodes. Finally it is inherent that there exists cooperative control between the IP [i.e. packet exchanger] and MPLS [i.e. path controller] signaling to establish the routes, as the routes are established responsive to demands to access remote IP networks, but are implemented using MPLS label switch establishment commands [Page 15-20, Section 6, Pages 13-14, Section 5.2]. Finally, *Rajagoplan* discloses that OSPF Opaque-LSAs, with the appropriate extensions, may be used to distribute topology information, including topology state information and that RSVP-TE may be used to establish paths within the network [Pages 15-16, Section 6.1.1].)

Therefore, since *Rajagoplan* suggests a combined IP router utilizing OSPF, it would have been obvious to a person of ordinary skill in the art at the time of the invention to implement combined IP and optical signaling into as taught by *Rajagoplan* into the teachings of *Xu.* Combined IP and optical signaling into as taught by *Rajagoplan* can be implemented into the system of *Xu* by moving the optical network control instance from the optical ingress router to the optical edge router as taught by *Rajagoplan* and implementing cooperative IP and MPLS control of routing in the separated packet and control units of *Xu* by means of BGP signaling and OSPF. The motive to combine is provided by *Rajagoplan* and is to allow the IP network to use explicit route signaling if the opposing MPLS network is trusted (Page 15, Section 6, Pages 13-14, Section 5).

Xu fails to disclose an optical network further comprising sections for establishing optical paths using OSPF-TE as a routing protocol. In the same field of endeavor, *Kompella* discloses an optical network further comprising sections for establishing optical paths using OSPF-TE as a routing protocol (Page 3, Abstract and Pages 5). (The system of *Kompella* discloses the use of OSPF-TE in a GMPLS network in order to transmit traffic load information within the network.)

Therefore, since *Kompella* discloses the use of OSPF-TE in a GMPLS network, it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the OSPF-TE routing protocol of *Kompella* with the system of *Xu* by replacing the OSPF protocol of *Xu* as modified by *Rajagoplan* with OSPF-TE to allow the system to transmit extended LSAs with traffic engineering information in the network. The motive to combine is provided by *Kompella* and is to allow the OSPF routing protocol to carry extended information that enables the use of traffic engineering to improve network utilization and robustness (See Pages 3-4).

Regarding claim 19, *Xu* discloses A packet exchanger (Figure 1, Element A2) in an information transmission network system, having a plurality of line exchangers (Figure 1, Elements X1 and X2) and a plurality of packet exchangers, (Figure 1, Elements A1 and A3) comprising:

a. Line switches, (Figure 1, Elements X5 and X2) connected to the line exchangers, having a function for connecting the communication lines arbitrarily (It is officially noted that optical cross connects contain line switches that can connect input and output ports arbitrarily).

b. A packet switch (Figure 1, Element A2) having function for selecting communication lines used for transmittance, in accordance with packet-ingress-side's information transmitted by the communication lines and outputting the same (Pages 4-7). (Routers A2, A3, A5 and A7 Maintain Standard IP routing tables which determine the routes to the layer 3 neighbors [Page 7, Section 6.1]. These routes are distributed via BGP instances maintained at each IP router via the communication lines [Page 5].)

c. A section for controlling packet paths having functions for acknowledging connection-related-information with respect to packet exchange by exchanging information of the packet paths via the communication lines among the packet exchangers connected via the communication lines, and determining a communication line for output (Page 6). (The client side ingress edge router exchanges IP network reachability information with the provider side ingress edge router which forewords the information to the other client side ingress routers and vice versa [Page 6].)

d. Wherein the communication lines are Synchronous Optical NETwork/Synchronous Digital Hierarchy (SONET/SDH) lines (Pages 4-7 and 14). (The communications lines used in the system of *Xu* may comprise underlying SONET/SDH transmission paths [See Page 14, LSP Type - “SDH" and "SONET"].)

Xu further discloses a plurality of *optical ingress routers* for setting communication lines among the packet exchangers comprising:

a. At least a section for controlling line paths in the line exchangers, connected to the communication lines among the packet exchangers/line exchangers, for exchanging connection information of the communication lines and acknowledging line connection conditions in a communication network (Pages 7-8 and Page 9, “In provider networks, both….” to end of page). (Intra domain link status information is disseminated using an IGP and stored in all border network entities (BNEs) and non BNEs [Page 9, “In provider networks, both….” to end of page]. Therefore, topology information [including, at a minimum, fiber optic link status] concerning the internal links [including the optic links] is exchanged via an IGP and stored by the border network entity (BNE)/edge router control instance. Finally, upon demand, a path for carrying packets between Client A, Location 1 and Client A, Location 2, is created when the ingress BGP speaker/edge router feeds a signal that establishes the route to the intra-domain routing process [Figure 1, Connection between A2 and A7 and Page 7, Numbers 7-9]. The path may be set up/torn down on demand [Page 8, Numeral 2].)

b. A cooperative control section having a function for receiving instructions by new communication lines, referring to two pieces of information, connection information, with respect to the packet exchange, collected by the section for controlling line paths, (i.e. internal intra-domain optical routing information) and connection information with respect to the packet exchange collected by the section for controlling packet paths, (i.e. the IP information of the exit edge router) selecting paths used for the new communication lines, and instructing the section for controlling line paths to set paths being used for the new communication lines wherein the section for controlling line paths has functions for transmitting messages to the line exchangers to set up lines in accordance with the instructed path, instructed by the cooperative control section, so that the line exchangers, receive the messages for controlling and setting the connected lines, set up the communication lines, and send control messages to the line exchangers for setting the lines in accordance with the instructed paths wherein the section for controlling line paths has functions for transmitting messages to the line exchangers to set up lines in accordance with the instructed path, instructed by the cooperative control section, so that the line exchangers, receive the messages for controlling and setting the connected lines, set up the communication lines, and send control messages to the line exchangers for setting the lines in accordance with the instructed paths (Pages 4-8). (The provider ingress edge router has an intra-domain routing process that creates the intra domain label switched path based on the interior optical network information [Page 7, Section 8] and the egress edge IP address [Page 7, Section 8]. Therefore, it is inherent that the instruction to create such a path must include the connection information of the line exchange and the packet path information.)

Xu fails to disclose a plurality a packet/line exchanger in an information transmission network system, having a plurality of line exchangers and a plurality of packet exchangers, for setting communication lines among the packet exchangers, comprising at least a section for controlling line paths in the line exchangers, connected to the communication lines among the packet exchangers/line exchangers, for exchanging connection information of the communication lines and acknowledging line connection conditions in a communication network a cooperative control section having a function for receiving instructions by new communication lines, referring to two pieces of information, connection information, with respect to the packet exchange, collected by the section for controlling line paths, and connection information with respect to the packet exchange collected by the section for controlling packet paths, selecting paths used for the new communication lines, and instructing the section for controlling line paths to set paths being used for the new communication lines wherein the section for controlling line paths has functions for transmitting messages to the line exchangers to set up lines in accordance with the instructed path, instructed by the cooperative control section, so that the line exchangers, receive the messages for controlling and setting the connected lines, set up the communication lines, and send control messages to the line exchangers for setting the lines in accordance with the instructed paths wherein the section for controlling line paths has functions for transmitting messages to the line exchangers to set up lines in accordance with the instructed path, instructed by the cooperative control section, so that the line exchangers, receive the messages for controlling and setting the connected lines, set up the communication lines, and send control messages to the line exchangers for setting the lines in accordance with the instructed paths wherein Open Shortest Path First-Traffic Engineering (OSPF) is used as a communication protocol for the communication lines. In the same field of endeavor, *Rajagoplan* discloses a plurality a packet/line exchanger in an information transmission network system,

having a plurality of line exchangers and a plurality of packet exchangers, for setting communication lines among the packet exchangers, comprising at least a section for controlling line paths in the line exchangers, connected to the communication lines among the packet exchangers/line exchangers, for exchanging connection information of the communication lines and acknowledging line connection conditions in a communication network a cooperative control section having a function for receiving instructions by new communication lines, referring to two pieces of information, connection information, with respect to the packet exchange, collected by the section for controlling line paths, and connection information with respect to the packet exchange collected by the section for controlling packet paths, selecting paths used for the new communication lines, and instructing the section for controlling line paths to set paths being used for the new communication lines wherein the section for controlling line paths has functions for transmitting messages to the line exchangers to set up lines in accordance with the instructed path, instructed by the cooperative control section, so that the line exchangers, receive the messages for controlling and setting the connected lines, set up the communication lines, and send control messages to the line exchangers for setting the lines in accordance with the instructed paths wherein the section for controlling line paths has functions for transmitting messages to the line exchangers to set up lines in accordance with the instructed path, instructed by the cooperative control section, so that the line exchangers, receive the messages for controlling and setting the connected lines, set up the communication lines, and send control messages to the line exchangers for setting the lines in accordance with the instructed paths wherein Open Shortest Path First-Traffic Engineering (OSPF) is used as a communication protocol for the communication lines (Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1). (If the exterior IP domain is trusted, the edge routers can receive interior routing and link state information from the optical network and may also signal explicit routes through the

network via the control domain [Page 15, Section 6, Pages 13-14, Section 5.2]. It is further inherent that the received information concerning the interior state of the optical network is stored, as it is used for explicit route determination at the edge nodes. Finally it is inherent that there exists cooperative control between the IP [i.e. packet exchanger] and MPLS [i.e. path controller] signaling to establish the routes, as the routes are established responsive to demands to access remote IP networks, but are implemented using MPLS label switch establishment commands [Page 15, Section 6, Pages 13-14, Section 5.2]. Finally, *Rajagoplan* discloses that OSPF Opaque-LSAs, with the appropriate extensions, may be used to distribute topology information, including topology state information and that RSVP-TE may be used to establish paths within the network [Pages 15-16, Section 6.1.1].)

Therefore, since *Rajagoplan* suggests a combined IP router utilizing OSPF, it would have been obvious to a person of ordinary skill in the art at the time of the invention to implement combined IP and optical signaling into as taught by *Rajagoplan* into the teachings of *Xu.* Combined IP and optical signaling into as taught by *Rajagoplan* can be implemented into the system of *Xu* by moving the optical network control instance from the optical ingress router to the optical edge router as taught by *Rajagoplan* and implementing cooperative IP and MPLS control of routing in the separated packet and control units of *Xu* by means of BGP signaling and OSPF. The motive to combine is provided by *Rajagoplan* and is to allow the IP network to use explicit route signaling if the opposing MPLS network is trusted (Page 15, Section 6, Pages 13-14, Section 5).

Xu fails to disclose an optical network further comprising sections for establishing optical paths using OSPF-TE as a routing protocol. In the same field of endeavor, *Kompella* discloses an optical network further comprising sections for establishing optical paths using OSPF-TE as

a routing protocol (Page 3, Abstract and Pages 5). (The system of *Kompella* discloses the use of OSPF-TE in a GMPLS network in order to transmit traffic load information within the network.)

Therefore, since *Kompella* discloses the use of OSPF-TE in a GMPLS network, it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the OSPF-TE routing protocol of *Kompella* with the system of *Xu* by replacing the OSPF protocol of *Xu* as modified by *Rajagoplan* with OSPF-TE to allow the system to transmit extended LSAs with traffic engineering information in the network. The motive to combine is provided by *Kompella* and is to allow the OSPF routing protocol to carry extended information that enables the use of traffic engineering to improve network utilization and robustness (See Pages 3-4).

5. **Claims 4-5** are rejected under 35 U.S.C. 103(a) as being unpatentable over X*u*, et al. (Y. Xu, A. Basu and Y. Xue, IETF Draft, June 2002, A BGP/GMPLS Solution for Inter-Domain Optical Networking) in view of *Rajagoplan,* et al. (B. Rajagoplan, J. Liciani, D. Aduche, B. Cain, B. Jamoussi and D. Saha, IP over Optical Networks: A Framework – Second Draft Version, 6 June 2002, Internet Engineering Task Force, Pages 1-41), *Kompella* (K. Kompella, J. Drake, G. Bernstein, D. Fedyk, E. Mannie, D. Saha, and V. Sharma, OSPF Extensions in Support of Generalized MPLS, Network Working Group- Internet draft: draft-kompella-ospf-gmpls-extensions-02, July 2001, Pages 1-9), *Jagannath* (US Patent No. 6,483,833 B1) and *Francisco*, et al. (Mark Joseph Francisco, Stephen Simpson, Lambros Pezoulas, Changcheng Huang, Ioannis Lambadaris, Interdomain Routing In Optical Networks, Proceedings of SPIE Opticomm, August 2001, Pages 1-10).

For Claim 4, X*u* discloses an optical edge router, (Figure 1, A2 and B2 and Page 5) used for an optical network, for transmitting packets between external IP networks and the optical edge router (Page 5, the Client Network B is an IP network and the Provider network A is an optical Network) and a program, used for optical networks and optical edge routers having se comprising:

a. A section for transmitting the packets between neighboring routers in neighboring external IP networks (Pages 5-6 - The IP Client Router A2 transmits packets to the Client A A3 IP router via the provider network).

b. A section for producing packet forwarding tables which set to where the packets are to be transmitted in the section for transmitting the packets (Page 6 – The different edge client edge routers learn the CAG routes and associated IP address via EGP. It is inherent that these routes are used to create a forwarding table, as the packets are switched according to the received routes.)

c. A section for exchanging route information between the neighboring routers (Page 6 – the edge router A2 uses traditional BGP to exchange routing information with neighboring routers.)

d. An *optical ingress router* (i.e. a provider BNE – See Page 5, Figure 1, Element X1) comprising a section for signaling so as to establish/release optical paths (Page 7, Step 8, The ingress BGP speaker [i.e. X1] uses an intra domain routing process to establish an intra domain optical circuit.) a section for notifying route information to other optical

edge routers which face the optical edge router (Page 6, Section 4.1, Point 2 – BNEs disseminate CAGs via BGP to the other BNEs in the provider domain)

e. A section for collecting topology information existing in the optical network and storing the collected topology information in a storage section (Page 9 – The BNEs in the provider domain store link state information).

f. Wherein the routing protocols for exchanging route information among the external IP networks are activated among the optical network control instances in the *optical ingress* routers to which the external IP networks are connected (Page 6). (The optical ingress routers/provider BNEs treat the corresponding BNE at the other side of an optical link as a BGP neighbor [Page 6, - X2 treats Y1 as a BGP circuit switching neighbor/peer]. The route information is then exchanged via an interior Border Gateway Protocol [Page 6].)

g. Wherein BGPs are used for protocols for exchanging the route information of the external IP networks (Page 6). (The optical ingress routers/provider BNEs treat the corresponding BNE at the other side of an optical link as a BGP neighbor [Page 6, - X2 treats Y1 as a BGP circuit switching neighbor/peer]. The route information of the external IP networks is then exchanged via an interior Border Gateway Protocol [Page 6].)

h. Wherein the optical paths are wavelength paths (Pages 13-14). (The path type may be a lambda [i.e. wavelength] path [Page 14, Encoding type “Lambda”].)

Xu fails to disclose an optical network wherein each of the *optical edge routers* comprises a section for signaling so as to establish/release optical paths and a section for collecting topology information existing in the optical network and storing the collected topology information in a storage section using Open Shortest Pat First (OSPF). In the same field of endeavor, *Rajagoplan* discloses an optical network wherein each of the *optical edge routers* comprises a section for signaling so as to establish/release optical paths and a section for collecting topology information existing in the optical network and storing the collected topology information in a storage section using Open Shortest Path First (OSPF) as a routing protocol (Pages 15-16, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1). (If the exterior IP domain is trusted, the edge routers can receive interior routing information from the optical network and may also signal explicit routes through the network [Page 15, Section 6, Pages 13-14, Section 5.2]. It is further inherent that the received information concerning the interior state of the optical network is stored, as it is used for explicit route determination at the edge nodes. Finally, *Rajagoplan* discloses that OSPF Opaque-LSAs, with the appropriate extensions, may be used to distribute topology information, including topology state information [Pages 15-16, Section 6.1.1].)

Therefore, since *Rajagoplan* suggests a combined IP router using OSPF using BGP signaling, it would have been obvious to a person of ordinary skill in the art at the time of the invention to implement combined IP and optical signaling into as taught by *Rajagoplan* into the teachings of *Xu.* Combined IP and optical signaling into as taught by *Rajagoplan* can be implemented into the system of *Xu* by moving the optical network control instance from the optical ingress router to the optical edge router as taught by *Rajagoplan* while using OSPF-TE for the distribution of topology information and BGP to control the establishment of routing paths. The motive to combine is provided by *Rajagoplan* is to allow the IP network to use

explicit route signaling if the IP network is trusted, while using common and well known protocols to discover and establish routes through the network (Page 15, Section 6, Pages 13-14, Section 5).

X*u* fails to disclose an optical network wherein the routing protocols for exchanging route information among the external IP networks are activated among the optical network control instances in the edge routers to which the external IP networks are connected and wherein BGPs *initiated in the optical edge router* are used for protocols for exchanging the route information of the external IP networks. In the same field of endeavor, *Rajagoplan* discloses an optical network wherein the routing protocols for exchanging route information among the external IP networks are activated among the optical network control instances in the edge routers to which the external IP networks are connected and wherein BGPs *initiated in the optical edge router* are used for protocols for exchanging the route information of the external IP networks (Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1). (The system of *Rajagoplan* discloses moving the optical path signaling and the edge of the internal optical network from the ingress edge provider router to the customer edge IP router [Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1].

Therefore, since *Rajagoplan* suggests including the customer edge router in the internal optical network and using the customer edge router/optical ingress router to signal and establish optical paths that link the two customer networks, it would have been obvious to a person of ordinary skill in the art at the time of the invention to move the BGP signaling to the edge of the network. That is, since the border of the optical network has been moved out to the customer edge, it would have been obvious to a person of ordinary skill in the art at the time of the invention that the border gateway protocol signaling that is associated with the border of the network should also be moved to the edge of the network along with the optical network control

instance. Edge BGP as taught by *Rajagoplan* can be combined with the system of *Xu* by moving the BGP signaling from the provider edge router to the customer edger router, as taught by *Rajagoplan,* and communicating the BGP state between the customer edge routers using the same method as was previously used to communicate between provider edge routers as taught by *Xu* (See *Xu*, Page 6). The motive to combine is to allow the dissemination of IP routes to other network domains.

Xu fails to disclose a router comprising a section for collecting topology information using OSPF-TE as a routing protocol. In the same field of endeavor, *Kompella* discloses a router comprising a section for collecting topology information using OSPF-TE as a routing protocol (Page 3, Abstract and Pages 5). (The system of *Kompella* discloses the use of OSPF-TE in a GMPLS network in order to transmit traffic load information within the network.)

Therefore, since *Kompella* discloses the use of OSPF-TE in a GMPLS network, it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the OSPF-TE routing protocol of *Kompella* with the system of *Xu* by replacing the OSPF protocol of *Xu* as modified by *Rajagoplan* with OSPF-TE to allow the system to transmit extended LSAs with traffic engineering information in the network. The motive to combine is provided by *Kompella* and is to allow the OSPF routing protocol to carry extended information that enables the use of traffic engineering to improve network utilization and robustness (See Pages 3-4).

Xu fails to disclose signaling so as to establish/release the optical paths using Border Gateway Protocol (BGP). In the same field of endeavor, *Francisco* discloses signaling so as to establish/release the optical paths using Border Gateway Protocol (BGP) (Introduction Pages 1-2). (The system of *Francisco* dslcoses the use of BGP for establishing and releasing interdomainpaths).

Therefore, since *Francisco* suggests the use of BGP for establishing interdomain paths in optical networks, it would have been obvious to a person of ordinary skill in the art at the time of the invention to implement the optical BGP signaling of *Francisco* into the teachings of *Xu* by establishing optical paths using BGP signaling. The motive to combine is provided by *Francisco* and is to re-use the widely deployed BGP protocol to enable end-to-end lightpath connections (Pages 1-2, Introduction) and also by *Rajagoplan* which suggests that the use of BGP for establishing end-to-end lightpaths should be explored (Section 7.7.2, Page 31).

Xu fails to disclose an optical network wherein each of the *optical edge routers* comprises a section for notifying route information to other optical edge routers which face the optical edge router. In the same field of endeavor, *Rajagoplan* discloses an optical network wherein each of the *optical edge routers* comprises a section for notifying route information to other optical edge routers which face the optical edge router (Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1). (The system of *Rajagoplan* discloses moving the optical path signaling and the edge of the internal optical network from the ingress edge provider router to the customer edge IP router [Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1].)

Therefore, since *Rajagoplan* suggests including the customer edge router in the internal optical network and using the customer edge router/optical ingress router to signal and establish optical paths that link the two customer networks, it would have been obvious to a person of ordinary skill in the art at the time of the invention to move the BGP signaling to the edge of the network. That is, since the border of the optical network has been moved out to the customer edge, it would have been obvious to a person of ordinary skill in the art at the time of the invention that the border gateway protocol signaling that is associated with the border of the network should also be moved to the edge of the network along with the optical network control

instance. Edge BGP as taught by *Rajagoplan* can be combined with the system of *Xu* by moving the BGP signaling from the provider edge router to the customer edger router, as taught by *Rajagoplan,* and communicating the BGP state between the customer edge routers using the same method as was previously used to communicate between provider edge routers as taught by *Xu* (See *Xu*, Page 6)*.* The motive to combine is to allow the dissemination of IP routes to other network domains.

Xu fails to disclose a router comprising a section for producing a routing table and storing the produced routing table in a storage section a section for reading out the routing table and the topology information from the storage section and producing packet forwarding tables which set to where the packets are to be transmitted in the section for transmitting the packets. In the same field of endeavor, *Jagannath* discloses a router comprising a section for producing a routing table and storing the produced routing table in a storage section a section for reading out the routing table and the topology information from the storage section and producing packet forwarding tables which set to where the packets are to be transmitted in the section for transmitting the packets (Column 4, Lines 50-67).

Therefore, since *Jagannath* discloses the use of a routing and label table, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the routing and label tables of *Jagannath* in the system of *Xu*. The routing and label tables of *Jagannath* can be combined with the system of *Xu* by implementing a routing table based on received routing information and implementing a label table based on the routing table and the allocated label switched paths as taught by *Jagannath*. The motive to combine is to allow the connection of specific IP addresses to labels.

For Claim 5, X*u* discloses a program, used for optical networks and optical edge routers (Figure 1, A2 and B2 and Page 5) having sections for predetermined calculations (Page 6 – It is

inherent that the client edge routers calculate forwarding tables) and sections for transmitting packets between the section for predetermined calculations and external IP networks, (Pages 5-6 - The IP Client Router A2 transmits packets to the Client A A3 IP router via the provider network) wherein the section for the predetermined calculations comprises functions of producing a packet forwarding table which sets where the packets are to be transmitted to by the section for transmitting the packets (Page 6 – The different edge client edge routers learn the CAG routes and associated IP address via EGP. It is inherent that these routes are used to create a forwarding table, as the packets are switched according to the received routes.) and for exchanging route information between neighboring routers (Page 6 – the edge router A2 uses traditional BGP to exchange routing information with neighboring routers) wherein the optical paths are wavelength paths (Pages 13-14). (The path type may be a lambda [i.e. wavelength] path [Page 14, Encoding type “Lambda”].).

X*u* further discloses a program, used for optical networks and *optical ingress routers* [i.e. provider edge routers] having a section for predetermined calculations (Pages 5-6, The X1 optical edge router forwards frames, and therefore inherently have a calculated forwarding table, among other predetermined calculations) wherein the section for the predetermined calculations comprises functions of notifying route information to other optical edge routers which face the optical edge router, (Page 6, Section 4.1, Point 2 – BNEs disseminate CAGs via BGP to the other BNEs in the provider domain) collecting topology information inside the optical networks and storing the collected topology information in the storage section, (Page 9 – The BNEs in the provider domain exchange and store link state information) and signaling so as to establish/release the optical paths (Page 7, Step 8, The ingress BGP speaker [i.e. X1] uses an intra domain routing process to establish an intra domain optical circuit.)

Xu fails to disclose a program, used for optical networks and *optical edge routers* having a section for predetermined calculations wherein the section for the predetermined calculations comprises functions of collecting topology information inside the optical networks and storing the collected topology information in the storage section using Open Shortest Path First (OSPF) as a routing protocol, and signaling so as to establish/release the optical paths. In the same field of endeavor, *Rajagoplan* discloses a program, used for optical networks and *optical edge routers* having a section for predetermined calculations wherein the section for the predetermined calculations comprises functions of collecting topology information inside the optical networks and storing the collected topology information in the storage section using Open Shortest Path First (OSPF) as a routing protocol, and signaling so as to establish/release the optical paths (Pages 15-16, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1). (If the exterior IP domain is trusted, the edge routers can receive interior routing information from the optical network and may also signal explicit routes through the network [Page 15, Section 6, Pages 13-14, Section 5.2]. It is further inherent that the received information concerning the interior state of the optical network is stored, as it is used for explicit route determination at the edge nodes. Finally, *Rajagoplan* discloses that Opaque-LSAs, with the appropriate extensions, may be used to distribute topology information, including topology state information [Pages 15-16, Section 6.1.1].)

Therefore, since *Rajagoplan* suggests a combined IP router using OSPF, it would have been obvious to a person of ordinary skill in the art at the time of the invention to implement combined IP and optical signaling into as taught by *Rajagoplan* into the teachings of *Xu.* Combined IP and optical signaling into as taught by *Rajagoplan* can be implemented into the system of *Xu* by moving the optical network control instance from the optical ingress router to the optical edge router as taught by *Rajagoplan* while using OSPF-TE for the distribution of

topology information. The motive to combine is provided by *Rajagoplan* is to allow the IP network to use explicit route signaling if the IP network is trusted, while using common and well known protocols to discover and establish routes through the network (Page 15, Section 6, Pages 13-14, Section 5).

Xu fails to disclose a router comprising a section for collecting topology information using OSPF-TE as a routing protocol. In the same field of endeavor, *Kompella* discloses a router comprising a section for collecting topology information using OSPF-TE as a routing protocol (Page 3, Abstract and Pages 5). (The system of *Kompella* discloses the use of OSPF-TE in a GMPLS network in order to transmit traffic load information within the network.)

Therefore, since *Kompella* discloses the use of OSPF-TE in a GMPLS network, it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the OSPF-TE routing protocol of *Kompella* with the system of *Xu* by replacing the OSPF protocol of *Xu* as modified by *Rajagoplan* with OSPF-TE to allow the system to transmit extended LSAs with traffic engineering information in the network. The motive to combine is provided by *Kompella* and is to allow the OSPF routing protocol to carry extended information that enables the use of traffic engineering to improve network utilization and robustness (See Pages 3-4).

Xu fails to disclose signaling so as to establish/release the optical paths using Border Gateway Protocol (BGP). In the same field of endeavor, *Francisco* discloses signaling so as to establish/release the optical paths using Border Gateway Protocol (BGP) (Introduction Pages 1-2). (The system of *Francisco* dslcoses the use of BGP for

Therefore, since *Francisco* suggests the use of BGP for establishing interdomain paths in optical networks, it would have been obvious to a person of ordinary skill in the art at the time of the invention to implement the optical BGP signaling of *Francisco* into the teachings of *Xu* by

establishing optical paths using BGP signaling. The motive to combine is provided by *Francisco* and is to re-use the widely deployed BGP protocol to enable end-to-end lightpath connections (Pages 1-2, Introduction) and also by *Rajagoplan,* which suggests that the use of BGP for establishing end-to-end lightpaths should be explored (Section 7.7.2, Page 31).

Xu fails to disclose a program, used for optical networks and *optical edge routers* having a section for predetermined calculations wherein the section for the predetermined calculations comprises functions of notifying route information to other optical edge routers which face the optical edge router. In the same field of endeavor, *Rajagoplan* discloses a program, used for optical networks and *optical edge routers* having a section for predetermined calculations wherein the section for the predetermined calculations comprises functions of notifying route information to other optical edge routers which face the optical edge router (Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1). (The system of *Rajagoplan* discloses moving the optical path signaling and the edge of the internal optical network from the ingress edge provider router to the customer edge IP router [Page 15, Section 6, Pages 13-14, Section 5.2 and Page 9, Figure 1].)

Therefore, since *Rajagoplan* suggests including the customer edge router in the internal optical network and using the customer edge router/optical ingress router to signal and establish optical paths that link the two customer networks, it would have been obvious to a person of ordinary skill in the art at the time of the invention to move the BGP signaling to the edge of the network. That is, since the border of the optical network has been moved out to the customer edge, it would have been obvious to a person of ordinary skill in the art at the time of the invention that the border gateway protocol signaling that is associated with the border of the network should also be moved to the edge of the network along with the optical network control instance. Edge BGP as taught by *Rajagoplan* can be combined with the system of *Xu* by

moving the BGP signaling from the provider edge router to the customer edger router, as taught by *Rajagoplan,* and communicating the BGP state between the customer edge routers using the same method as was previously used to communicate between provider edge routers as taught by *Xu* (See *Xu*, Page 6). The motive to combine is to allow the dissemination of IP routes to other network domains.

Xu fails to disclose a program, used for optical networks and *optical edge routers* having a section for producing a routing table and storing the produced routing table in a storage section and reading out the routing tables and the topology information from the storage sections and producing a packet forwarding table which sets, e.g., where the packets are to be transmitted to by the section for transmitting the packets. In the same field of endeavor *Jagannath* discloses a program, used for optical networks and *optical edge routers* having a section for producing a routing table and storing the produced routing table in a storage section and reading out the routing tables and the topology information from the storage sections and producing a packet forwarding table which sets, e.g., where the packets are to be transmitted to by the section for transmitting the packets (Column 4, Lines 50-67).

Therefore, since *Jagannath* discloses the use of a routing and label table, it would have been obvious to a person of ordinary skill in the art to use the routing and label tables of *Jagannath* in the system of *Xu*. The routing and label tables of *Jagannath* can be combined with the system of *Xu* by implementing a routing table based on received routing information and implementing a label table based on the routing table and the allocated label switched paths as taught by *Jagannath*. The motive to combine is to allow the connection of specific IP addresses to labels.

6. **Claims 6, 9, 12 and 15** are rejected under 35 U.S.C. 103(a) as being unpatentable over *Rosen*, et al. (E. Rosen, A. Viswanathan and R. Callon, Multiprotocol Label Switching Architecture, Internet Engineering Task Force, July 2000) in view of *Sasagawa* (US Patent No. 7,336,648 B1), X*u*, et al. (Y. Xu, A. Basu and Y. Xue, IETF Draft, June 2002, A BGP/GMPLS Solution for Inter-Domain Optical Networking) and *Braun*, et al. (Braun, Guenter, and Khalil, Management of quality of service enabled VPNs, Communications Magazine, IEEE , vol.39, no.5, pp.90-98, May 2001).

Regarding claim 6, *Rosen* discloses a cutting-through method (Page 20- See (a), infra) for direct communication by a plurality of edge routers for connecting a core network and a plurality of external IP networks mutually at border points of the core network and the external IP networks, (Pages 4-6) comprising:

a. Maintaining lists, in which ingress-side IP address correspond to identifiers for showing egress edge routers, in ingress edge routers (Pages 4-6 and Page 20). (The network of *Rosen* discloses an Ingress Edger router which maps IP addresses (i.e. FEC's) to specific label switched paths, which serve to identify the outgoing egress label router of the MPLS network [Pages 4-6]. Such mapping is done by means of a routing table, which matches IP address ranges [i.e. FEC's] to label switched paths [Page 5]. The paths are then routed through the MPLS network to a corresponding egress edger router connected to another IP domain, where the label is removed and the packet forwarded using its IP address [Pages 4-6].)

b. Adding the identifiers corresponding to the ingress-side IP address to the IP packets by the ingress edge routers when IP packets are transmitted (Pages 4-6 and 20). (The label for the LSP is added at the ingress edge router - See also (a), Supra).

c. Transmitting the IP packets to the outgoing interfaces by referring to the identifiers added to the IP packets in the egress edge routers wherein Multi-Protocol Label Switching (MPLS) labels are used for the identifiers (Pages 4-6 and 20 - See (a), Supra).

d. Wherein the optical paths are wavelength paths (Pages 13-14). (The path type may be a lambda [i.e. wavelength] path [Page 14, Encoding type “Lambda”].)

Rosen fails to disclose maintaining lists, in which ingress-side IP address correspond to identifiers for showing *outgoing interfaces* of egress edge routers, in ingress edge routers. In the same field of endeavor, *Sasagawa* discloses maintaining lists, in which ingress-side IP address correspond to identifiers for showing *outgoing interfaces* of egress edge routers, in ingress edge routers (Column 1, Lines 1-32). (*Sasagawa* discloses that an egress-side label switch router may be broken into several "logical" label switch routers (LSRs) which appear to outside LSRs [including ingress LSRs] as independent label switch routers [Column 8, Line 52 to Column 9, 9, Line 18]. The purpose of the “logical” LSRs is to allow other routers to precisely specify the egress port to which a LSP is to terminate when establishing the LSP path [Column 7, Lines 44-50 and Column 11, Line 42 to Column 12, Line 52, Particularly Column 12, Lines 17-52, See also Claim 1-4].)

Therefore, since *Sasagawa* suggests the use of egress port specific LSPs, it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the

egress port specific LSPs of *Sasagawa* with the system of *Rosen* by establishing and forwarding LSPs to specific output ports on the egress edge routers. The motive to combine is provided by *Sasagawa* and is to avoid the inefficiency of having to use IP to route packets to the output port of the edge router and to allow for the use of sophisticated traffic engineering techniques (Column 1, Lines 59-67, Column 4, Lines 13-20 and Column 7, Lines 43-50).

Rosen fails to disclose the core network is a GMPLS network wherein Generalized Multi-Protocol Label Switching (GMPLS) labels are used for the identifiers and the core network and the external IP networks are optical networks in which edge routers are connected directly by optical paths. In the same field of endeavor, *Xu* discloses the core network is a GMPLS network wherein Generalized Multi-Protocol Label Switching (GMPLS) labels are used for the identifiers and the core network and the external IP networks are optical networks in which edge routers are connected directly by optical paths (Fig. 1 and Page 3, Section 3). (*Xu* discloses a network where the core provider and the client networks are connected by optical paths [Fig. 1]. *Xu* further disclose the use of GMPLS as an extension to MPLS so that core networks utilizing optical connections may operate using the MPLS protocol [Page 3, Section 3].)

Therefore, since *Xu* suggests replacing an MPLS core network with a GMPLS core network, it would have been obvious to a person of ordinary skill in the art at the time of the invention to implement the GMPLS core network of *Xu* into the teachings of *Rosen* by swapping out the layer 1 links of the of network of *Sasagawa* for optical connections and then using the GMPLS extensions to MPLS to control the optical connections, as taught by *Xu,* and further by connecting the provider edge and the customer edge routers using an optical connection, as taught by *Xu*. The motive to combine is to update the network of *Sasagawa* to utilize optical connections as carriers for MPLS traffic.

Rosen fails to disclose a cutting-through method wherein correspondence information with respect to the ingress-side IP address and its corresponding identifiers are exchanged among the edge routers by control signals. In the same field of endeavor, *Braun* discloses a cutting-through method wherein correspondence information with respect to the ingress-side IP address and its corresponding identifiers are exchanged among the edge routers by control signals (Page 92, “Multiprotocol Label Switching” - The labels and IP addresses associated with LSPs are exchanged between the edge routers.)

Therefore, since *Braun* discloses the use of label and IP distribution, it would have been obvious to a person of ordinary skill in the art at the time of the invention to implement the label and IP distribution of *Braun* into the teachings of *Rosen*. The label and IP distribution of *Braun* can be implemented into the system of *Rosen* by distributing labels and associated IP information from the egress edge router to the ingress edge router as taught by *Braun*. The motive to combine is to allow the egress edge routers of *Rosen* to communicate network information concerning the established label paths, thereby allowing communication of reachability information between the edge routers.

Regarding claim 9, *Rosen* discloses an edge router comprising inputting sections for connecting a core network and a plurality of external IP networks at border points mutually and handling incoming IP packets, inputted from the external IP networks, to the core network and outputting sections for handling outgoing IP packets outputted from the core network to the external IP networks, (Pages 4-6 and 20) wherein the inputting sections has:

a. A section for maintaining lists, in which ingress-side IP addresses correspond to identifiers for showing outgoing egress edge routers (Pages 4-6 and Page 20). (The network of *Rosen* discloses an Ingress Edger router which maps IP addresses (i.e.

FEC’s) to specific label switched paths, which serve to identify the outgoing egress label router of the MPLS network [Pages 4-6]. Such mapping is done by means of a routing table, which matches IP address ranges [i.e. FEC's] to label switched paths [Page 5]. The paths are then routed through the MPLS network to a corresponding egress edger router connected to another IP domain, where the label is removed and the packet forwarded using its IP address [Pages 4-6].)

b. A section for adding the identifiers corresponding to the ingress-side IP addresses of the IP packets to the IP packets, in accordance with the lists when the IP packets are transmitted to other edge routers, and the outputting section has a section for referring to the identifiers and transmitting the IP packets to the outgoing interfaces, indicated by the identifiers wherein Multi-Protocol Label Switching (MPLS) labels are used for the identifiers (Pages 4-6 and page 20 – See (a), Supra).

c. Wherein the optical paths are wavelength paths (Pages 13-14). (The path type may be a lambda [i.e. wavelength] path [Page 14, Encoding type “Lambda”].)

Rosen fails to disclose the input section has a section for maintaining lists, in which ingress-side IP address correspond to identifiers for showing *outgoing interfaces* of egress edge routers, in ingress edge routers. In the same field of endeavor, *Sasagawa* discloses the input section has a section for maintaining lists, in which ingress-side IP address correspond to identifiers for showing *outgoing interfaces* of egress edge routers, in ingress edge routers (Column 1, Lines 1-32). (*Sasagawa* discloses that an egress-side label switch router may be broken into several "logical" label switch routers (LSRs) which appear to outside LSRs

[including ingress LSRs] as independent label switch routers [Column 8, Line 52 to Column 9, 9, Line 18]. The purpose of the "logical" LSRs is to allow other routers to precisely specify the egress port to on which a LSP is to terminate when establishing the LSP path [Column 7, Lines 44-50 and Column 11, Line 42 to Column 12, Line 52, Particularly Column 12, Lines 17-52, See also Claim 1-4].)

Therefore, since *Sasagawa* suggests the use of egress port specific LSPs, it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the egress port specific LSPs of *Sasagawa* with the system of *Rosen* by establishing and forwarding LSPs to specific output ports on the egress edge routers. The motive to combine is provided by *Sasagawa* and is to avoid the inefficiency of having to use IP to route packets to the output port of the edge router and to allow for the use of sophisticated traffic engineering techniques (Column 1, Lines 59-67, Column 4, Lines 13-20 and Column 7, Lines 43-50).

Rosen fails to disclose the core network is a GMPLS network wherein Generalized Multi-Protocol Label Switching (GMPLS) labels are used for the identifiers and the core network and the external IP networks are optical networks in which edge routers are connected directly by optical paths. In the same field of endeavor, *Xu* discloses the core network is a GMPLS network wherein Generalized Multi-Protocol Label Switching (GMPLS) labels are used for the identifiers and the core network and the external IP networks are optical networks in which edge routers are connected directly by optical paths (Fig. 1 and Page 3, Section 3). (*Xu* discloses a network where the core provider and the client networks are connected by optical paths [Fig. 1]. *Xu* further disclose the use of GMPLS as an extension to MPLS so that core networks utilizing optical connections may operate using the MPLS protocol [Page 3, Section 3].)

Therefore, since *Xu* suggests replacing an MPLS core network with a GMPLS core network, it would have been obvious to a person of ordinary skill in the art at the time of the

invention to implement the GMPLS core network of *Xu* into the teachings of *Rosen* by swapping out the layer 1 links of the of network of *Sasagawa* for optical connections and then using the GMPLS extensions to MPLS to control the optical connections, as taught by *Xu,* and further by connecting the provider edge and the customer edge routers using an optical connection, as taught by *Xu*. The motive to combine is to update the network of *Sasagawa* to utilize optical connections as carriers for MPLS traffic.

Rosen fails to disclose an edge router further comprising a section for exchanging information, in which the ingress-side IP addresses correspond to the identifiers, among other edge routers mutually by control signals, and wherein the section for maintaining the lists has a section for generating or updating the lists in accordance with the information obtained by the exchanging section with respect to the correspondence information between the ingress-side IP addresses and the identifiers. In the same field of endeavor, *Braun* discloses an edge router further comprising a section for exchanging information, in which the ingress-side IP addresses correspond to the identifiers, among other edge routers mutually by control signals, and wherein the section for maintaining the lists has a section for generating or updating the lists in accordance with the information obtained by the exchanging section with respect to the correspondence information between the ingress-side IP addresses and the identifiers (Page 92, “Multiprotocol Label Switching” - The labels and IP addresses associated with LSPs are exchanged between the edge routers and the label paths are updated appropriately.)

Therefore, since *Braun* discloses the use of label and IP distribution, it would have been obvious to a person of ordinary skill in the art at the time of the invention to implement the label and IP distribution of *Braun* into the teachings of *Rosen*. The label and IP distribution of *Braun* can be implemented into the system of *Rosen* by distributing labels and associated IP information from the egress edge router to the ingress edge router as taught by *Braun*. The

motive to combine is to allow the egress edge routers of *Rosen* to communicate network information concerning the established label paths, thereby allowing communication of reachability information between the edge routers.

Regarding claim 12, *Rosen* discloses a program, installed to an information processing apparatus, (It is inherent that the routers of *Rosen* included processors) for realizing functions corresponding to edge routers, the functions being inputting functions, for connecting a core network and a plurality of external IP networks at border points mutually and handling incoming IP packets inputted from the external IP networks to the core network and outputting functions, for handling outgoing IP packets outputted from the core network to the external IP networks, wherein, the inputting functions serve for (Pages 4-6 and 20):

a. A function for maintaining lists in which ingress-side IP addresses correspond to identifiers for showing outgoing interfaces of other egress edge routers. (Pages 4-6 and Page 20). (The network of *Rosen* discloses an Ingress Edger router which maps IP addresses (i.e. FEC’s) to specific label switched paths, which serve to identify the outgoing egress label router of the MPLS network [Pages 4-6]. Such mapping is done by means of a routing table, which matches IP address ranges [i.e. FEC's] to label switched paths [Page 5]. The paths are then routed through the MPLS network to a corresponding egress edger router connected to another IP domain, where the label is removed and the packet forwarded using its IP address [Pages 4-6].)

b. A function for adding the identifiers corresponding to the ingress-side IP addresses of the IP packets to the IP packets in accordance with the lists when the IP packets are transmitted to other edge routers, and the outputting function serves for referring to the

identifiers and transmitting the IP packets, indicated by the identifiers, to the outgoing interfaces wherein Multi-Protocol Label Switching (MPLS) labels are used for the identifiers (Pages 4-6 and page 20 – See (a), Supra).

c. Wherein the optical paths are wavelength paths (Pages 13-14). (The path type may be a lambda [i.e. wavelength] path [Page 14, Encoding type “Lambda”].)

Rosen fails to disclose a function for maintaining lists, in which ingress-side IP address correspond to identifiers for showing *outgoing interfaces* of egress edge routers, in ingress edge routers. In the same field of endeavor, *Sasagawa* discloses a function for maintaining lists, in which ingress-side IP address correspond to identifiers for showing *outgoing interfaces* of egress edge routers, in ingress edge routers (Column 1, Lines 1-32). (*Sasagawa* discloses that an egress-side label switch router may be broken into several "logical" label switch routers (LSRs) which appear to outside LSRs [including ingress LSRs] as independent label switch routers [Column 8, Line 52 to Column 9, 9, Line 18]. The purpose of the “logical” LSRs is to allow other routers to precisely specify the egress port to on which a LSP is to terminate when establishing the LSP path [Column 7, Lines 44-50 and Column 11, Line 42 to Column 12, Line 52, Particularly Column 12, Lines 17-52, See also Claim 1-4].)

Therefore, since *Sasagawa* suggests the use of egress port specific LSPs, it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the egress port specific LSPs of *Sasagawa* with the system of *Rosen* by establishing and forwarding LSPs to specific output ports on the egress edge routers. The motive to combine is provided by *Sasagawa* and is to avoid the inefficiency of having to use IP to route packets to the

output port of the edge router and to allow for the use of sophisticated traffic engineering techniques (Column 1, Lines 59-67, Column 4, Lines 13-20 and Column 7, Lines 43-50).

Rosen fails to disclose Generalized Multi-Protocol Label Switching (GMPLS) labels are used for the identifiers and the core network and the external IP networks are optical networks in which edge routers are connected directly by optical paths. In the same field of endeavor, *Xu* discloses Generalized Multi-Protocol Label Switching (GMPLS) labels are used for the identifiers and the core network and the external IP networks are optical networks in which edge routers are connected directly by optical paths (Fig. 1 and Page 3, Section 3). (*Xu* discloses a network where the core provider and the client networks are connected by optical paths [Fig. 1]. *Xu* further disclose the use of GMPLS as an extension to MPLS so that core networks utilizing optical connections may operate using the MPLS protocol [Page 3, Section 3].)

Therefore, since *Xu* suggests replacing an MPLS core network with a GMPLS core network, it would have been obvious to a person of ordinary skill in the art at the time of the invention to implement the GMPLS core network of *Xu* into the teachings of *Rosen* by swapping out the layer 1 links of the of network of *Sasagawa* for optical connections and then using the GMPLS extensions to MPLS to control the optical connections, as taught by *Xu,* and further by connecting the provider edge and the customer edge routers using an optical connection, as taught by *Xu*. The motive to combine is to update the network of *Sasagawa* to utilize optical connections as carriers for MPLS traffic.

Rosen fails to disclose a program according further comprising a function for exchanging information, in which the ingress-side IP addresses correspond to the identifiers, among other edge routers mutually by control signals, and wherein the function for maintaining the lists serves for generating or updating the lists in accordance with the information obtained by the exchanging section with respect to the correspondence information between the ingress-side IP

addresses and the identifiers. In the same field of endeavor, *Braun* discloses a program according further comprising a function for exchanging information, in which the ingress-side IP addresses correspond to the identifiers, among other edge routers mutually by control signals, and wherein the function for maintaining the lists serves for generating or updating the lists in accordance with the information obtained by the exchanging section with respect to the correspondence information between the ingress-side IP addresses and the identifiers (Page 92, “Multiprotocol Label Switching” - The labels and IP addresses associated with LSPs are exchanged between the edge routers and the label paths are updated appropriately.)

Therefore, since *Braun* discloses the use of label and IP distribution, it would have been obvious to a person of ordinary skill in the art at the time of the invention to implement the label and IP distribution of *Braun* into the teachings of *Rosen*. The label and IP distribution of *Braun* can be implemented into the system of *Rosen* by distributing labels and associated IP information from the egress edge router to the ingress edge router as taught by *Braun*. The motive to combine is to allow the egress edge routers of *Rosen* to communicate network information concerning the established label paths, thereby allowing communication of reachability information between the edge routers.

Regarding claim 15, *Rosen* discloses a recording medium, readable by the information processing apparatus, on which the program according is recorded (It is inherent that the edge router of *Rosen* uses a processor. It is further inherent that the processor contains memory, upon which instructions are executed.)

Response to Arguments

7. Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher Crutchfield whose telephone number is (571) 270-3989. The examiner can normally be reached on Monday through Friday 8:00 AM to 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Daniel Ryman can be reached on (571) 272-3152. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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